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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/200,495	11/25/98	VAN BUSKIRK	P 2771-337(PC8)
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MMC1/0724

EXAMINER

HU.S

ART UNIT

PAPER NUMBER

2811

DATE MAILED:

07/24/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/200,495

Applicant(s)

Buskirk et al.

Examiner

Shouxiang Hu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE three MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on May 15, 2001

2a) ☐ This action is FINAL.

2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) 40-60 is/are pending in the application.

4a) Of the above, claim(s) 58-60 is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) 40-57 is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirements.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

a) ☐ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

15) ☒ Notice of References Cited (PTO-892)

18) ☐ Interview Summary (PTO-413) Paper No(s). _____

16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

19) ☐ Notice of Informal Patent Application (PTO-152)

17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____

20) ☐ Other: _____

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DETAILED ACTION

Election/Restriction

1. Claims 58-60 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim.

Applicant timely traversed the restriction (election) requirement in Paper No. 11.

Applicant's election with traverse of Species I in Paper No. 11 is acknowledged.

Applicant's arguments regarding the election requirement have been fully considered but they are not persuasive. The traversal is mainly on the ground that the restriction (election) requirement is not based on respective alternative species claimed by Applicant. In response, it is noted that the subject matter of Species I (claims 40-57) can be interpreted by the examiner as an invention in which the top electrode does not have to comprise an oxygen-donor compound; while an oxygen-donor compound has to be included in the invention of Species II (claims 58-60). Species I and II are thereby patentably distinct. The requirement is still deemed proper and is therefore made FINAL.

Claim Objections

2. Claims 40-57 are objected to because claim 40 fails to clearly define what the oxygen content is in a depth deeper than 25 Angstroms in the ferroelectric oxide layer.

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Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claim 53 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. According to the common understanding in the art that the oxygen lattice sites in an oxide material are normally fully occupied by oxygen when the oxide material meets its stoichiometric oxygen requirement. It is not clear how the excess oxygen can also be present in a lattice portion of the oxide material, as claimed in claim 53.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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6. Claims 40-57, insofar as in compliance with 35 U.S.C.112, are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishioka ("Nishioka"; 5,973,911).

First it is noted that the subject matter of the top surface region in the limitation recited in claim 40 that the top surface region of within a depth of 25 Angstroms of the ferroelectric oxide film has an oxygen contents equal to or in excess of its stoichiometric oxygen requirement is interpreted by the examiner as meaning: the top surface region can also be larger than 25 Angstroms, as the claim does not clearly define the oxygen content in the depth deeper than 25 Angstroms.

Nishioka disclose a microelectronic device structure (Figs. 3-6), comprising: a top electrode layer (6; Pt, Ir, or Ir oxide, see col. 4, lines 23-26) on a ferroelectric oxide film material (5 or 9; PZT or BST). Nishioka further disclose that the ferroelectric film approaches becoming a perfectly structured BST film by a single step of oxygen annealing after forming the top electrode; and that the leakage current can be further decreased by oxygen annealing both just before and after forming the top electrode (see col. 3, lines 1-31).

It is noted that, according to the common understanding in the art, the stoichiometric oxygen requirement is normally inherently met in an oxide material when it is perfectly structured, as it contains no oxygen defects or deficiency. And, additional oxygen annealing tends to cause the oxide material to have an oxygen contents in excess of its stoichiometric oxygen requirement.

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Although Nishioka does not expressly disclose that a top surface layer of within a depth of 25 Angstroms of the ferroelectric oxide film has an oxygen content equal to or in excess of its stoichiometric oxygen requirement, it is noted that, since Nishioka teaches that the leakage current can be reduced by eliminating oxygen holes or deficiency through sufficient oxygen annealing (see col. 3, lines 1-31), it would be well within the ordinary skill in the art to form the microelectronic device of Nishioka with the top surface region within a depth equal to or deeper than 25 Angstrom in the ferroelectric oxide film having an oxygen content equal to or in excess of its stoichiometric oxygen requirement, so that any oxygen holes or deficiency in the top surface region would be eliminated.

Regarding claims 45 and 48, it is noted that it is old and well known in the art that ferroelectric film material can be formed with a strontium bismuth tantalate material; and, that Pt oxide is one of the commonly used materials for the top capacitor electrode layer.

Regarding claim 54, it is noted that a ferroelectric film in a memory device normally contains grains separated by grain boundaries. Accordingly, the excess oxygen in the top surface region can be inherently present in its grain boundaries.

Regarding the limitations recited in claims 56 and 57 on how the top electrode and the top surface region are made, these limitations would not carry patentable weight in those claims drawing to a structure, because distinct structure is not necessarily produced. In re Thorpe, 227 USPQ 964, 966 (Fed. Cir. 1985).

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7. Claims 40-57, insofar as in compliance with 35 U.S.C.112, are further rejected under 35 U.S.C. 103(a) as being unpatentable over Larson et al. ("Larson"; 5,216,572).

Larson disclose a microelectronic device structure (Figs. 7 and 8), comprising: a top electrode layer (26) on a ferroelectric oxide film material (24; PZT); and a top surface region (24(a)) with additional oxygen through oxygen ion implantation (see col. 6, lines 27)

Although Larson does not expressly disclose that the top surface region has a depth of 25 Angstroms and has an oxygen content equal to or in excess of its stoichiometric oxygen requirement, it is noted that the ion implantation depth (or energy) and dose are both well recognized parameters of importance subject to routine experimentation and optimization.

Therefore, it would have been obvious to one of ordinary skilled in the art at the time the invention was made to make the microelectronic device of Larson with the top surface region having a depth of 25 Angstroms and having an oxygen content equal to or in excess of its stoichiometric oxygen requirement, so that the optimized performance would be achieved.

Regarding claims 44-52, it is noted that it is old and well known in the art that ferroelectric film material can be formed with materials of barium titanate and strontium bismuth tantalate; and, that Pt, Ir and their oxides are two of the commonly used materials for the top capacitor electrode layer.

Regarding claim 54, it is noted that a ferroelectric film in a memory device normally contains grains separated by grain boundaries. Accordingly, the excess oxygen in the top surface region can be inherently present in its grain boundaries.

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Regarding the limitations recited in claims 56 and 57 on how the top electrode and the top surface region are made, these limitations would not carry patentable weight in those claims drawing to a structure, because distinct structure is not necessarily produced. In re Thorpe, 227 USPQ 964, 966 (Fed. Cir. 1985).

Response to Arguments

8. Applicant's arguments with respect to claims 40-50 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

9. Papers related to this application may be submitted to Technology center (TC) 2800 by facsimile transmission. Papers should be faxed to TC 2800 via the TC 2800 Fax center located in Crystal Plaza 4, room 4-C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The Group 2811 Fax Center number is (703) 308-7722 or 308-7724. The Group 2811 Fax Center is to be used only for papers related to Group 2811 applications.

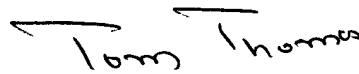
Any inquiry concerning this communication or earlier communications from the examiner should be directed to ***Shouxiang Hu*** whose telephone number is **(703) 306-5729**. The examiner can normally be reached on Tuesday through Friday from 7:30 AM to 5:00 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, ***Tom Thomas***, can be reached on (703) 308-2772. The appropriate fax phone number for the organization where this application or proceeding is assigned is (703) 308-7724.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Technology Center Receptionists** whose telephone number is (703) 308-0956.

Shouxiang Hu
July 19, 2001


TOM THOMAS
SUPERVISORY PATENT EXAMINER